



Nuclear O&M

Kyle Cooper



Introduction

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Goals of today's presentation

- General overview of nuclear O&M activities
- Takeaways associated with current practices
- What will be needed to optimize nuclear O&M



Overview of OM activities

Routine/Daily Operations

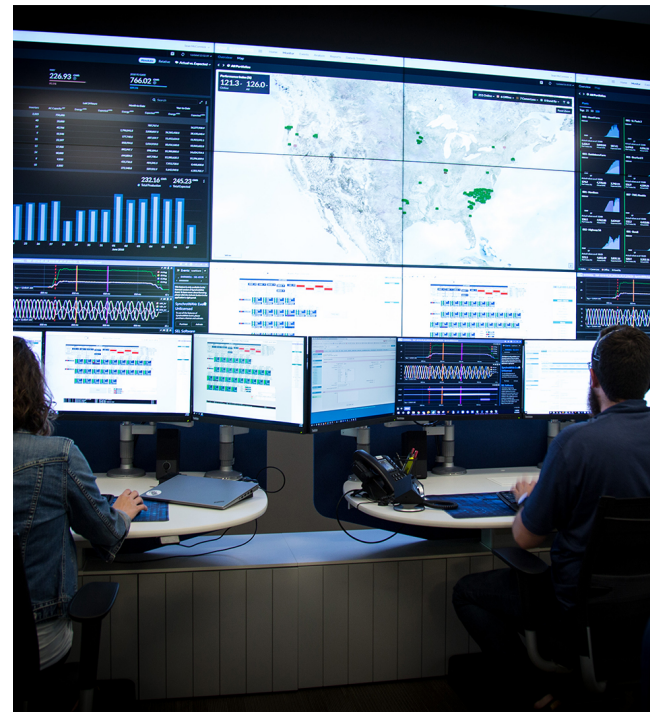
- Minimum staffing governed by accident conditions
 - Fire brigade, ASSD, SBO, etc
 - Staff includes Operators, Technicians, HP, Chemistry, Security
- Employee utilization concentrated on inspections

Ongoing planned maintenance

- Essentially every week has planned support system maintenance
- Primarily comprised of planned preventative maintenance
- Frequencies selected on time-based systems
- Requires multidisciplinary support



Source: NOVA



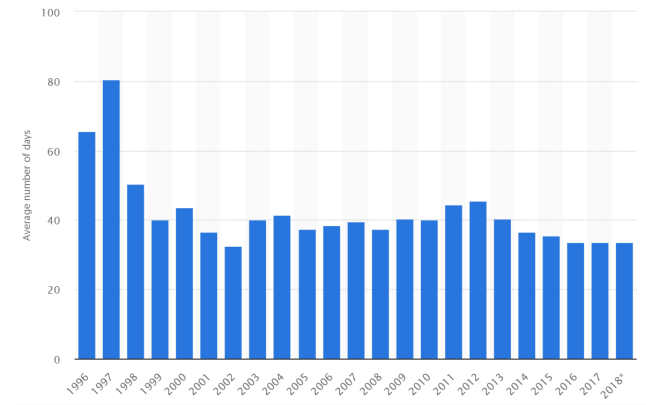
Overview of OM activities

Reactive maintenance

- Unpredictable and inefficient
- Impacts site capacity and/or risk
- Requires multidisciplinary support

Refueling outages

- Scheduled based on depletion of the fuel (typical 18-24 month cycle for LWR)
- Refueling guides critical patch, averaged 33 days in 2018
- Also perform extensive inspection and maintenance on critical/generating systems
- Requires massive staffing augmentations and multidisciplinary support



Takeaways – The status quo

- Effective -> 90% CF since 2001
- Lowest limit of staffing bounded by accident response
- Focused primarily on the support systems
- Labor intensive
 - Local sensor reading
 - Local operation
 - Manual equipment
- Complicated
 - Manual nature of operations and maintenance actions
 - Requires highly trained personnel to interpret data and operate equipment
 - Intrusive inspections and non-condition based maintenance introduce failure mechanisms



Optimization Opportunities

Instrumentation

- Sensors for all critical equipment
- Digitalization – remote logging, accurate monitoring

Move away from time based maintenance frequencies

- Predictive maintenance – Traditional and AI
- Automated anomaly detection in digital data
- Limit needs for refueling

Smart systems

- Make accident response easier
- Digital and automated control systems for operation

Rethink current guidelines, Maintenance Rule, and INPO Index

- Allow non-critical failures





Questions
